

What is claimed is:

1. A treated wood having a surface and substrate of wood cellulose comprising:

wood cellulose cross-linked with boric acid and a first film-forming polymer to form macromolecules including cellulosic borate ester chains;

a continuous film topcoat, comprising a second film-forming polymer, cross-linked with said macromolecules;

borax dispersed in said substrate; and

a metallocene catalyst dispersed in said substrate.

2. The treated wood of claim 1 further comprising a free-radical initiator.

3. The treated wood of claim 1 wherein said free-radical initiator comprises at least one selected from the group of iodine compounds, oxidizers, silver solutions and peroxides.

4. The treated wood of claim 1 wherein a biocide is encapsulated in said topcoat.

5. The treated wood of claim 1 wherein said first film-forming polymer and said second film-forming polymer are the same polymer.

6. The treated wood of claim 1 wherein said metallocene catalyst comprises at least one of the group consisting of tin and titanium.

7. The treated wood of claim 1 wherein said second film-forming polymer comprises at least one of an acrylic siloxane polymer and a urethane siloxane polymer.

8. The treated wood of claim 1 wherein said cellulose borate macromolecules penetrate the substrate to a depth of about 1/16 of an inch to about 1/8 of an inch.

9. A coating system for treating wood comprising:
a penetrating solution comprising boric acid, a metallocene catalyst, borax, a free radical initiator and a first film-forming polymer;
a topcoat composition comprising a second film-forming
5 polymer; and
at least one of said penetrating solution and said topcoat composition further comprises an adhesion promoter.

10. The coating system of claim 9 wherein said first film-forming polymer is present in the penetrating solution in amounts of from about 55% to about 80% based on dry solids.

11. The coating system of claim 9 further comprising a wetting agent.

12. The coating system of claim 11 wherein said wetting agent comprises propylene glycol.

13. The coating system of claim 12 wherein said free radical initiator is present in the penetrating solution in amounts from about 0.25% to about 2.5% based on dry solids.

14. The coating system of claim 9 wherein said free radical initiator comprises at least one selected from the group of iodine compounds, oxidizers, silver solutions and peroxides.

15. The coating system of claim 9 wherein said boric acid is present in amounts from about 1% to about 20% based on the weight of the dry solids in the penetrating solution.

16. The coating system of claim 9 wherein said metallocene catalyst comprises tin or titanium.

17. The coating system of claim 9 wherein said metallocene catalyst is present in amounts from about 0.1% to about 1.0% based on the weight of the dry solids of the penetrating solution.

18. The coating system of claim 9 wherein said first film-forming polymer is the same polymer as said second film-forming polymer.

19. The coating system of claim 18 wherein said film-forming polymer comprises an acrylic polymer.

20. The coating system of claim 9 wherein said adhesion promoter comprises epoxy silane.

21. A method of treating wood comprising:
emulsifying an aqueous solution of boric acid with a metallocene catalyst;

mixing borax into the emulsified solution;

adding a free-radical initiator to said aqueous solution;

emulsifying a first film-forming polymer with said aqueous solution to make a penetrating solution;

providing a topcoat coat composition comprised of a second film forming polymer;

applying the penetrating solution to wood substrate; and

applying the topcoat composition to the wood substrate previously treated with the penetrating solution.

22. The method of claim 21 further comprising emulsifying said second film-forming polymer with a biocide prior to said applying step.

23. The method of claim 21 further comprising blending at an adhesion promoter and propylene glycol to said emulsified solution prior to the stop of adding the free radical initiator.

24. A treated wood product comprising:

wood treated with a penetrating solution comprising boric acid, a metallocene catalyst, a free-radical initiator, and a first film forming polymer, and coated with a topcoat composition comprising a second film-forming polymer, said second film-forming polymer bonded to said first film-forming polymer.

25. A treated wood product as in claim 24 further comprising borax dispersed in the wood.